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COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS

Sub-Committee of Experts on the Transport of Dangerous Goods
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agenda item 6 (b))

EXPLOSIVES (CLASS 1)

Classification of 1H-Tetrazole under Division 1.1D

Transmitted by the Expert from Germany

Background

The substance 1H-Tetrazole will be placed on the market and its classification had to be decided on. 1H-Tetrazole can already be found in catalogues of commercial fine chemicals.

Properties

The compound was tested at the Federal Institute for Materials Research and Testing (BAM) according to the UN test methods for explosive substances of Class 1. The data obtained are presented on the following pages (Annex 1).

The outcome of the tests is that 1H-Tetrazole is a substance of Class 1.1D. It is not necessary to perform tests of Test Series 6 because the test results of test Series 1 and 2 show the high sensitivity of the substance to shock and the violent effect of heating under confinement. So probably a single package test (test 6(a)) with a standard detonator would lead to a mass explosion. The data sheet (Annex 2) gives further information necessary for classification.

Proposal

Considering the test results obtained (Annex 1), it is proposed to assign the substance 1H-Tetrazole to Division 1.1D.

The Proper shipping name should read: 1H-TETRAZOLE

Class or Division: 1.1D
UN number: xxxx
Concentration: 100 %
Subsidiary Risks: (-)
Special Provisions: (-)
Packing Group: II
Packing Method: Packing instruction 112(c).
Particular packing provisions or exceptions:

5. For UN xxxx packagings of metal shall not be used.

Annex 1

Test Report

1. Name of substance: 1H-Tetrazole

2. General data
2.1 Composition: 1H-Tetrazole, technical pure
2.2 Molecular formula: CH_2N_4
2.3 Physical form: Fine cristalline powder
2.4 Colour: White
2.5 Apparent density: 640 - 700 kg/m^3
2.6 Partical size: not determined

3. Box 2: Is the substance manufactured with the view to producing a practical explosive or pyrotechnic effect ?
3.1 Answer: No
3.2 Exit: Go to Box 3

4. Box 3: Test Series 1
4.1 Propagation of Detonation: UN gap test (test 1(a))
4.2 Sample conditions:
4.3 Observations:
4.4 Result: not performed, but see 6.1
4.5 Effect of heating under confinement: Koenen test (test 1(b))
4.6 Sample conditions: Mass 24,5 g
4.7 Observations: Limiting diameter 3 24 mm
Fragmentation type "G" (time to reaction 20 s,
duration of reaction 0 s)
4.8 Result: "+", shows some explosive effects on heating under confinement
4.9 Effect of ignition under confinement : Time/pressure test (test 1(c)(i)
4.10 Sample conditions:
4.11 Observations:
4.12 Result: not performed (safety reasons)
4.13 Exit: Go to box 4

5. Box 4: Is it an explosive substance ?
5.1 Answer from Test Series 1: Yes
5.2 Exit: go to box 5

6. Box 5: Test Series 2
6.1 Sensitivity to shock: BAM 2" steel tube test, standard detonator 0,6 g PETN
6.2 Sample conditions: Ambient temperature, mass 832 g
6.3 Observations: Fragmentation into > 10 pieces, no substance remains, detonation velocity > 2100 m/s
6.4 Result: "+", sensitive to shock

6.5 Effect of heating under confinement: Koenen test (test 2(b))
6.6 Sample conditions: Mass 24,5 g
6.7 Observations: Limiting diameter 3 24 mm Fragmentation type "G" (time to reaction 20 s, duration of reaction 0 s)
6.8 Result: "+", violent effect on heating under confinement
6.9 Effect of ignition under confinement: Time/pressure test (test 2(c)(i)
6.10 Sample conditions :
6.11 Observations:
6.12 Result: not performed (safety reasons)
6.13 Exit: Go to box 6

7. Box 6: Is the substance too insensitive for acceptance into Class 1 ?
7.1 Answer from Test Series 2: No
7.2 Conclusion: Substance to be considered for Class 1 (box 8)
7.3 Exit: Go to box 9

8. Box 9: Test Series 3
8.1 Thermal stability: 75 0C/48 hour test (test 3(c))
8.2 Sample conditions: 100 g of substance at 75 0C
8.3 Observations: No ignition, explosion, self-heating or visible decomposition
8.4 Result: "-", thermally stable
8.5 Impact sensitivity: BAM fallhammer test (test 3(a)(ii))
8.6 Sample conditions: as received
8.7 Observations: Limiting impact energy 15 J
8.8 Result: "-", not too dangerous to transport in form tested
8.9 Friction sensitivity: BAM friction test (test 3(b)(i))
8.10 Sample conditions: as received
8.11 Observations: Limiting load > 360 N
8.12 Result: "-", not too dangerous to transport in form tested
8.13 Response of a substance to fire: Small scale tests (BAM)
8.14 Sample conditions: Ambient temperature
8.15 Obs ervations: Only partial ignition and decomposition
8.16 Result: "-", not too dangerous to transport in form tested
8.17 Exit: Go to box 10

9. Box 10: Is the substance thermally stable ?
9.1 Answer from test 3(c): Yes
9.2 Exit: Go to box 11

10. Box 11: Is the substance too dangerous for transport in the form in which it was tested ?
10.1 Answer from Test Series 3: No
10.2 Exit: Go to box 18

11. Conclusion: PROVISIONALLY ACCEPT INTO CLASS 1
11.1 Exit: Apply the Class 1 assignment procedure

It should not be necessary to perform tests of Test Series 6 because the test results of Test Series 1 and 2 show the high sensitivity of the substance to shock and the violent effect of heating under confinement. In all probability a single package test (test 6(a)) with a standard detonator leads to a mass explosion. Therefore the substance 1H-Tetrazole should be a candidate of Division 1.1D.

Proposed assignment

Proper shipping name: 1H-TETRAZOLE
UN number: xxxx
Division: 1.1D
Packing group: II
Packing method: Packing instruction 112(c).
Particular packing provisions or exceptions:

5. For UN xxxx packagings of metal shall not be used.

Annex 2

DATA SHEET TO BE SUBMITTED TO THE UNITED NATIONS FOR NEW OR AMENDED CLASSIFICATION OF SUBSTANCES

Submitted by . . . . . Date . . . . . .

Supply all relevant information including sources of basic classification data. Data should relate to the product in the form to be transported. State test methods. Answer all questions - if necessary state "not known" or "not applicable" - If data is not available in the form requested, provide what is available with details. Delete inappropriate words.

Section 1. SUBSTANCE IDENTITY

1.1 Chemical name **1H-TETRAZOLE** . . . . . .

1.2 Chemical formula **CH_2N_4** . . . . . .

1.3 Other names/synonyms . . . . . .

1.4.1 UN number . . . . . 1.4.2 CAS number **288-94-8** . . . . . .

1.5 Proposed classification for the Recommendations

1.5.1 proper shipping name (3.1.2 */) **1H-TETRAZOLE** . . . . . .

1.5.2 class/division **1.1.D** . . . . . subsidiary risk(s) - . . . . . .
packing group **II** . . . . . .

1.5.3 proposed special provisions, if any - . . . . . .

1.5.4 proposed packing method **Packing instruction 113 (c). No packagings of metal shall be permitted.** . . . . . .

Section 2. PHYSICAL PROPERTIES

2.1 Melting point or range **154-158** °C

2.2 Boiling point or range -°C

2.3 Relative density at :

2.3.1 15 °C . . . . . .

2.3.2 20 °C **Apparent density 640-700 kg/m³** . . . . . .

2.3.3 50 °C . . . . . .

2.4 Vapour pressure at :

2.4.1 50 °C **not applicabel (n.a.)** . . . . . kPa

2.4.2 65 °C . . . . . kPa

2.5 Viscosity at 20°C**/ **n.a.** . . . . . m^2/s

2.6 Solubility in water at 20°C . . . . . g/100 ml

no data available (n.d.a.)

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*/ *This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.*

**/ *See definition of "liquid" in 1.2.1 of the Model Regulations on the Transport of Dangerous Goods.*

2.7 Physical state at 20°C (2.2.1.2*/) ~~solid/liquid/gas~~**/

2.8 Appearance at normal carriage temperatures, including colour and odour . . . . . .
Powder, white to off-white; odour : none . . . . . .

2.9 Other relevant physical properties . . . . . .
. . . . . .

Section 3. FLAMMABILITY

3.1 Flammable vapour **n.a.**

3.1.1 Flash point (2.3.3*/) . . . . . °C ~~oc/cc~~

3.1.2 Is combustion sustained? (2.3.1.2*/) **yes/no**

3.2 Autoignition temperature **n.d.a.** . . . . . °C

3.3 Flammability range (LEL/UEL)- . . . . . %

3.4 Is the substance a flammable solid? (2.4.2 */) **no**

3.4.1 If yes, give details . . . . . .
. . . . . .
. . . . . .

Section 4. CHEMICAL PROPERTIES

4.1 Does the substance require inhibition/stabilization or other treatment such as nitrogen blanket to prevent hazardous reactivity ? **yes/no**
If yes, state

4.1.1 Inhibitor/stabilizer used . . . . . .

4.1.2 Alternative method . . . . . .

4.1.3 Time effective at 55°C . . . . . .

4.1.4 Conditions rendering in ineffective . . . . . .

4.2 Is the substance an explosive according to paragraph 2.1.1.1? (2.1 */) **yes/no**

4.2.1 If yes, give details **see test data (Annex 1)** . . . . . .
. . . . . .
. . . . . .

4.3 Is the substance a desensitized explosive? (2.4.2.4 */) **yes/no**

4.3.1 If yes, give details . . . . . .
. . . . . .
. . . . . .

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**/ *See definition of "liquid" in 1.2.1 of the Model Regulations on the Transport of Dangerous Goods.*

4.4 Is the substance a self-reactive substance? (2.4.1 */) yes/no

If yes, state

4.4.1 exit box of flow chart . . . . . .

What is the self accelerating decomposition temperature (SADT) for a 50 kg package? . . . . . °C

Is the temperature control required? (2.4.2.3.5 */) yes/no

4.4.2 proposed control temperature for a 50 kg package . . . . . °C

4.4.3 proposed emergency temperature for a 50 kg package . . . . . °C

4.5 Is the substance pyrophoric? (2.4.3 */) yes/no

4.5.1 If yes, give details . . . . . .

. . . . . .

. . . . . .

4.6 Is the substance liable to self-heating? (2.4.3 */) yes/no

4.6.1 If yes, give details . . . . . .

. . . . . .

. . . . . .

4.7 Is the substance an organic peroxide (2.5.1 */) yes/no

If yes state

4.7.1 exit box of flow chart . . . . . .

What is the self accelerating decomposition temperature (SADT) for a 50 kg package? . . . . . °C

Is the temperature control required? (2.5.3.5.1 */) yes/no

4.7.2 proposed control temperature for a 50 kg package . . . . . °C

4.7.3 proposed emergency temperature for a 50 kg package . . . . . °C

4.8 Does the substance in contact with water emit flammable gases? (2.4.4 */) yes/no

4.8.1 If yes give details . . . . . .

. . . . . .

. . . . . .

4.9 Does the substance have oxidizing properties (2.5.1 */) yes/no

4.9.1 If yes, give details . . . . . .

. . . . . .

. . . . . .

4.10 Corrosivity (2.8 */) to:

4.10.1 mild steel . . . . . mm/year at . . . . . °C

4.10.2 aluminium . . . . . mm/year at . . . . . °C

4.10.3 other packaging materials

(specify) . . . . mm/year at . . . . .

. . . . mm/year at . . . . .

4.11 Other relevant chemical properties . . . . . .

may explode if heated above melting point; avoid contact with metals and metal salts, may form explosive compounds . . . . . .

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Section 5. HARMFUL BIOLOGICAL EFFECTS

5.1 LD 50, oral (2.6.2.1.1 */) **n.d.a.** ..... mg/kg Animal species .....

5.2 LD 50, dermal (2.6.2.1.2 */) **n.d.a.** ..... mg/kg Animal species .....

5.3 LC 50, inhalation (2.6.2.1.3 */) **n.d.a.** ... mg/litre Exposure time ..... hours
or ..... ml/m³ Animal species .....

5.4 Saturated vapour concentration at 20 °C (2.6.2.2.4.3 */) **n.a.** ..... ml/m³

5.5 Skin exposure (2.8 */) results Exposure time ..... hours/minutes
Animal species .....

5.6 Other data **Avoid contact with eyes, skin and clothing.** .....
Avoid inhalation. .....

5.7 Human experience .....
.....

Section 6. SUPPLEMENTARY INFORMATION

6.1 Recommended emergency action

6.1.1 Fire (include suitable and unsuitable extinguishing agents)
Suitable agents: water spray .....

6.1.2 Spillage **cover spilled substance with paper** .....

6.2 Is it proposed to transport the substance in :

6.2.1 Intermediate Bulk Containers (6.5*/) ? **yes/no**

6.2.2 Portable tanks (6.6*/) ? **yes/no**

If yes, give details in Sections 7 and/or 8.

Section 7. INTERMEDIATE BULK CONTAINERS (IBCs) (only complete if yes in 2.6.2.1.1)

7.1 Proposed type(s) .....

Section 8. MULTIMODAL TANK TRANSPORT (only complete if yes in 2.6.2.1.2)

8.1 Description of proposed tank (including IMO tank type if known) .....
.....

8.2 Minimum test pressure .....

8.3 Minimum shell thickness .....

8.4 Details of bottom openings, if any .....

8.5 Pressure relief arrangements .....

8.6 Degree of filling .....

8.7 Unsuitable construction materials .....

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